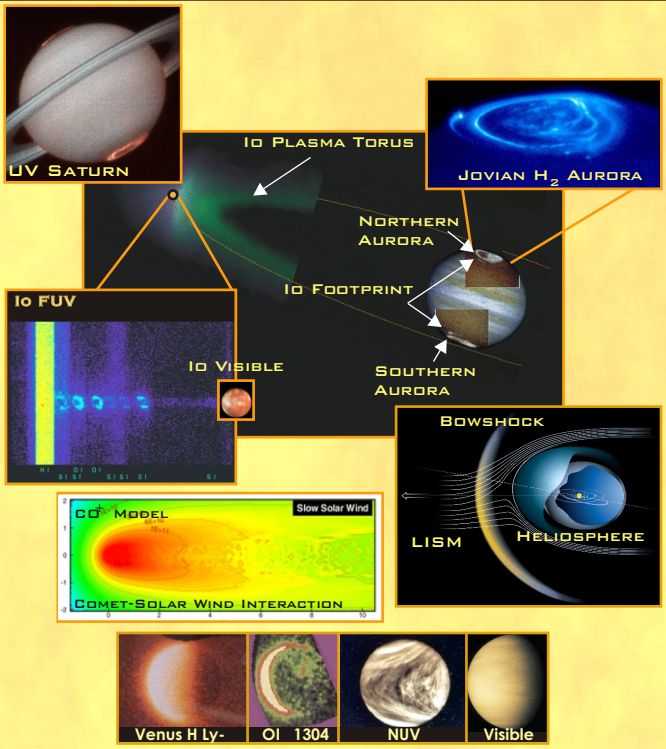
The Solar Connections Observatory for Planetary Environments

SCOPE



*The Solar Connections Observatory for Planetary Environments (**SCOPE**) characterizes and contrasts the solar interaction and response to solar variability of the Earth, planets, comets, and the local interstellar medium.*

Mission Description:

- Dual 1.0 m and 1.2 m telescopes covering the EUV and FUV to NUV bandpasses
- Remote sensing campaigns targeting planets, comets, the IPM, and Heliosphere
- The Earth is included as a primary science target and compared with identical observational approach to the other planets
- Remote perspective permits observations to 90° from the sub-spacecraft latitude
- Inner solar system observation capability for Venus, Mercury, and comets to within ~ 0.35 AU of the Sun
- High sensitivity, sub-arcsecond resolution imaging and spectroscopic modes
- Wide field non-imaging precision line profile mapping
- High speed photon counting detectors for precision time resolution
- Delta 2425 Launch to a 1 AU drift-away orbit
- MIDEX-class mission with 3-5 year operational lifetime

Technology Requirements:

- **SCOPE** employs spaceflight tested technologies that reduce risk and increase performance. *No new technological advances are needed for this mission*
- First use in planetary remote sensing of several existing technologies, including *Electron Bombarded CCDs, composite reflective filters, metal-composite mirrors, spatial heterodyne spectrographs, and target based tip-tilt feedback guiding*

Fundamental Question:

- How do the planets, comets, and local interstellar medium (LISM) interact with the Sun and respond to solar variability?

Importance:

- Achieving an understanding of the planet-Sun and solar-LISM connection advances our understanding of basic physical processes and increases our predictive capabilities for the terrestrial, planetary, and interplanetary environments where future remote and human exploration will occur.

Justification:

- Our understanding of magnetospheric and upper atmospheric processes on the other planets is limited due to a lack of dedicated programs to the global study of their response to solar input and its variability. This gap in our observational knowledge must be closed before a true comparative study of Sun-planet interactions will be possible

Science Objectives:

- Perform a pathfinding survey of the global characteristics of all solar interacting bodies, their basic response to solar input, and how it is affected by solar variability
- Identify the primary entry points, sources, sinks, and transport mechanisms for mass and energy in magnetospheres and upper atmospheres
- Determine the global effect of the internal characteristics of planet and comet systems, including magnetic field properties, atmospheric conductivity, satellites, rapid rotation, and in situ plasmas, on their near space environments
- Put the Earth in context with the other planets via comparative observations
- Map the full sky density and velocity characteristics of the interplanetary medium (IPM) and heliopause.
- Test and refine predictive models of solar wind propagation, the planetary near space environment, and upper atmospheric chemistry and circulation
- Characterize the response of solar system bodies to changes in solar activity

Measurement Strategies:

- Dedicated telescope for solar system remote sensing
- Intensive, target-specific campaigns to measure the response of each planet's near space environment and upper atmosphere to solar activity
- Coordinated planet and Earth observations at opposition to compare the response of both systems to the same solar wind stream
- Global imaging of auroral emissions, upper atmospheric circulation, exospheres, and near-space plasma distributions
- Imaging spectroscopy of UV ion-neutral emissions and atmospheric absorption features
- Narrow-field spectroscopy of planetary (auroral-dayglow-coronal) H Ly- line profiles at R>75000
- Wide-field averaged line profile measurements of diffuse H Ly- emission from the IPM, comets, geocorona, and the heliopause at R>100000
- Coordinated **SCOPE** observations of planetary targets the IPM and heliopause with remote probes of the planets, Sun, Earth, and heliosphere